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The A.C.E. mixture as an anæsthetic. By B. J. COLLINGWOOD and R. G. SPARKES.

"The A.C.E. mixture, which consists of absolute alcohol 1 vol., chloroform 2 vols., and pure ether 3 vols.....is said to be safer than chloroform. All its three constituents volatilise from it at an equal rate" (*Materia Medica* by Hale White M.D. 1907).

The estimations we have made lead to an opposite conclusion. As the vaporisation of such a mixture proceeds we find:

(1) That the relative amount of ether given off is constantly *de*creasing.

(2) That the relative amount of alcohol given off is constantly *de*creasing.

(3) That the relative amount of chloroform given off is constantly *in*creasing.

An anæsthetic mixture which exhibits such properties is open to very serious objections. Not only is the vapour given off inconstant in composition, but in addition its toxicity progressively increases.

Method adopted.

An A.C.E. mixture of the above composition was vaporised until only two-thirds of its original volume remained. An estimate was then made of the relative amounts of its constituents. The remainder was

then further vaporised to half its volume (equivalent to vaporisation of original mixture to one-third of its volume). An estimate was then made of its constituents.

The estimates were made as follows:

(1) *The alcohol.* A definite volume of the mixture was placed in a measuring glass. Water, previously saturated with chloroform and ether, was added. The flask was corked, shaken, and allowed to stand for some hours. The diminution in volume of the mixture was then noted, *i.e.* the drop in the line of junction between the water and the mixture. We had previously determined that this method gave a very accurate reading of the alcohol content of A.C.E. mixtures of known composition.

(2) *The chloroform and ether.* These were estimated indirectly from the following data:

(*a*) The alcohol content (estimated as above).
(*b*) The sp. gr. of the mixture.
(*c*) The sp. gr. of the alcohol, chloroform and ether used.

The relative amounts of the constituents *vaporised* was calculated from the above estimates with the following result:

	Vapour mixture during first period	Vapour mixture during second period
Ether	60·9	44·7
Alcohol	19·9	12·0
Chloroform	19·2	43·3.

Anæsthesia with known percentages of chloroform vapour. By N. H. ALCOCK and J. BLUMFELD.

We have applied Waller's method of producing chloroform anæsthesia, *i.e.* the plenum system with known percentage of chloroform vapour, to the human subject and this preliminary communication deals with 25 cases anæsthetised in the theatre of St Mary's Hospital. While the number of cases is too small to permit us to make a final statement as to the comparative safety of the method, yet certain very definite facts have been made out concerning the phenomena of anæsthesia in man.

In this series of experiments account has been taken only of the percentages in the inspired air, as this is the first point that requires to be determined from the practical side.

We have endeavoured to obtain anæsthesia in as rapid a manner as was consistent with safety, being guided in this by the work of Waller[1], Brodie and Widdows[2] and Buckmaster and Gardiner[3].

The average time of induction of anæsthesia was 8½ minutes, the minimum being 6 minutes and the maximum 12½ minutes.

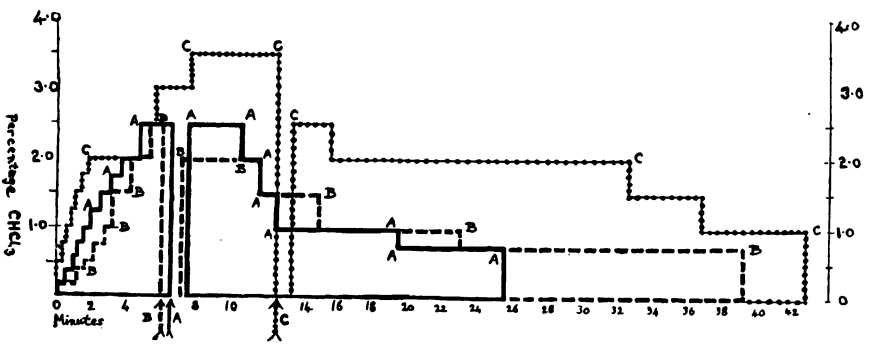
The following points were noted:

(1) In the majority of what may be termed "ordinary" cases a percentage of chloroform vapour gradually rising to 2½ % has been required for the induction of anæsthesia (middle curve).

(2) This percentage is departed from in both directions, some cases requiring less (lower curve), some more (higher curve), the latter especially in fat alcoholic persons.

(3) When anæsthesia is at all prolonged (more than about an hour) very small quantities of chloroform are required, usually less than 0·5 %. At the same time the percentage has had to be widely varied in accordance with the nature of the operator's action from one moment to another.

(4) Anæsthesia is more even and regular in the course of a long operation than with the open method. This regularity depends on the greater ease with which a uniform dosage is supplied than is the case with drop bottle methods however skilfully exercised. The apparatus used was that devised by one of us (N. H. A.) and described in the *Brit. Med. Journ.* Aug. 15, 1908.



Ordinates are percentages of $CHCl_3$. Abscissæ time in minutes.

A. Smooth line—ordinary case.

B. Broken line—case taking little $CHCl_3$ (Appendicitis).

C. Dotted line– case taking much $CHCl_3$ (Appendicitis).

The arrow shows the attainment of surgical anæsthesia.

[1] *Science Progress*, Vol. II. p. 610; *Lancet*, Nov. 28, 1903.

[2] *Brit. Med. Journal*, June, 1906.

[3] *Proc. Roy. Soc.* B, Vol. 78, p. 414; Vol. 79, p. 555, and p. 579.

The Influence of Exercise upon the Pulse and Blood-Pressure. By M. S. Pembrey and A. H. Todd.

It is well known that training enables the heart to adapt itself to the needs of muscular work and that a good "wind" depends upon a sound heart. Pronounced hyperpnoea can be produced within half a minute by running down and up stairs; this form of exercise was employed for a comparison of the effects produced upon the pulse and blood-pressure of men in training and out of training. The following table of results relates to two men who performed the same amount of exercise under similar conditions.

	A. B. (trained)			A. H. T. (untrained)		
Sept. 1908	Rest	Just after exercise	5 mins. later	Rest	Just after exercise	5 mins. later
4 B.-P. mm. Hg.:	110	134	118	104	134	108
Pulse ¼ min.:	13	28	14	18	27	24
7	122	134	126	110	140	106
	16	29	17	23	30	26
8	—	—	—	106	126	98
	17	—	17	21	32	22
9	132	152	132	108	126	110
	13	32	14	21	26	24
10	126	142	130	116	148	103
	14	31	13	20	36	21
11	116	136	129	122	148	116
	16	33	16	17	38	25
12	117	122	116	106	140	106
	14	30	14	21	40	27
14	111	140	115	110	128	108
	13	—	16	21	35	25
15	112	128	116	104	136	106
	16	34	17	17	34	23
16	112	132	118	108	139	106
	15	34	16	17	34	22
17	116	128	118	100	122	106
	15	32	18	19	40	25
18	116	126	117	100	128	108
	17	27	13	19	37	23
19	106 (?)	112	110	108	132	114
	13	30	13	21	40	24
21	108	114	110	106	136	106
	15	26	15	17	38	23
22	110	140	118	102	118	100
	12	34	17	19	37	21

In the well trained man the pulse rate was doubled by the effects of exercise but rapidly returned to its normal rate during rest; in the untrained man the increase in the rate was less and the recovery was delayed. The blood-pressure showed in the former a smaller rise and a more rapid recovery than in the case of the untrained man, whose blood-pressure often fell below the normal after five minutes rest.

In the trained man the fall in the rate of the pulse occurred so rapidly that it was necessary to observe it in periods of 15 seconds; within a minute the pulse would decrease from 26 to 17 and this decline was not uniform, for beats appeared to be dropped out. Auscultation showed the same condition.

After exercise of longer duration, running from a quarter of a mile to ten miles, the rapidity of the decline in the pulse rate during rest was slower, but it was always greater in the trained than in the untrained man.

Observations upon "Second Wind." By M. S. Pembrey and F. Cook.

Vigorous muscular exercise, such as running, produces dyspnoea after about a quarter of a mile has been accomplished, but if the pace be maintained in spite of the panting respiration the difficulty disappears, sometimes gradually, sometimes abruptly; the runner has now "got his second wind" and can continue running with comparative comfort. The causes of this accommodation need explanation.

A few observations[1] made by one of us in conjunction with C. A. Reynolds seemed to show that the dyspnoea in these cases was partly cardiac, for there was a less frequent and more regular contraction of the heart after the advent of "second wind."

The introduction by Haldane of a simple method of determining the composition of alveolar air afforded another means of investigation and experiments were made with the help of J. L. Rankine and M. Earle. These results which were communicated to a meeting of this Society (Dec. 12th, 1903) showed that the dyspnoea due to vigorous muscular work was accompanied in some cases by a rise, in others by a fall in the percentage of carbon dioxide in the alveolar air; the respiratory quotient was generally raised and was sometimes greater than unity.

[1] *Text-book of Physiology.* Edited by E. A. Schäfer. Vol. I. p. 747. 1898.

Further observations were made upon a greater number of men and similar results were obtained. It has been found necessary to make a series of comparative experiments with especial reference to the condition before and after the advent of "second wind." The following table gives examples of the chief results.

During vigorous muscular work the respiratory quotient rises at first and then falls; it appears to be highest when there is distress.

Subject	CO_2	O_2	$\frac{CO_2}{O_2}$	Pulse	
M. S. P.	5·11			19 (×4)	At rest.
(21. ix. '08)	5·55	15·49	1·0	30 27 27	After 8 laps ($\frac{1}{4}$ mile). Panting. Pulse irregular.
	5·50	15·39	0·99	35 32 31	After 18 further laps. Second wind at 10th. Pulse more regular. Sweating.
M. S. P.	5·13			19 (×4)	At rest.
(22. ix. '08)	5·76	15·19	1·2	35 32 27	After 6 laps. Panting. Pulse irregular.
	5·21	15·09	1·07	34 30 29	After 12 further laps. Second wind. Pulse more regular. Sweating.
J. H. R.	5·27	14·32	0·79		At rest.
(6. x. '08)	7·36	14·03	1·06		After 6 laps.
	5·91	14·62	0·93		After 8 further laps. Feeling more comfortable. Second wind. Sweating.
A. B.	6·04	14·48	0·93	19 (×4)	At rest.
(16. ix. '08)	8·13	13·17	1·04	38 33 30 30	After 8 laps.
	7·39	12·8	0·90	36 36 34 30	After 19 further laps. Second wind at 16th. Sweating.
A. B.	5·77	15·12	0·98	18 (×4)	At rest.
(7. ix. '08)	7·73	13·27	1·00		After 11 laps. Panting.
	7·02	13·19	0·95		15 further laps; second wind had appeared. Sweating.
A. B.	5·82	14·88	0·95		At rest.
(3. xii. '07)	7·43	13·90	1·05		After 8 laps.
	6·93	13·65	0·95		After 22 laps.
A. B.	6·02	14·68	0·96		At rest.
(22. xi. '07)	6·18	13·79	0·86		After 64 laps.

A note on colour fatigue. By B. J. COLLINGWOOD and R. F. WILKINSON.

We find that an eye which has been exposed to a mixture of spectral red and green exhibits a marked fatigue to a mixture of spectral yellow and blue.

On the hypothesis of Hering this fatigue could be explained by the breaking down of a white-black substance in both instances. Our observations, however, show that the mixtures of spectral red and green do not produce a sensation of white but of yellow. We are, therefore, inclined to attribute the fatigue to the common factor of a *sensation* of yellow in both colour mixtures.

It appears probable that the sensation of white, in so far as it is a compound colour sensation, is *ultimately* a compound of the sensations of blue and yellow. Such a view is in accordance with the theory of Franklin[1].

Method adopted.

The spectrum from a Nernst lamp was projected on to a white surface, and mirrors were so arranged as to throw the red rays on to the green and the yellow rays on to the blue. It was found:

(1) That the red-green mixture produced a very definite yellow sensation.

(2) That an eye which had been exposed for two minutes to the red-green mixture showed a marked fatigue to the yellow-blue mixture.

Observations upon the Respiration of Man when breathing air or oxygen. BY E. G. SCHLESINGER and M. S. PEMBREY.

For the purpose of other investigations upon the influence of oxygen on dyspnoea due to muscular exercise or disease, data were required upon the normal pulmonary ventilation of men at rest. The following table gives the results for 16 subjects, all medical students with two exceptions, and shows that the breathing of pure oxygen has little or no effect. The subjects did not know when they were breathing oxygen.

[1] *Zeitschrift f. Psychologie und Phys. d. Sinnesorgane*, IV. 1892.

	Subject	Age (years)	Weight (lbs.)	Height (ft. & ins.)	Air: Vol. per min. in litres	Air: Number of breaths	Air: Vol. of each breath in c.c.	Oxygen: Vol. per min. in litres	Oxygen: Number of breaths	Oxygen: Vol. of each breath in c.c.	Differences: Vol. per min. in c.c.	Differences: Number of breaths	Differences: Vol. of each breath in c.c.
1	(M. S.)	21·2	154	5·11	6·560	22·5	291	7·400	16·25	455	+ 840	−6·25	+164
2	(F. S.)	18·4	132	5·7	7·867	19·34	406	7·590	13·67	545	− 277	−5·67	+138
3	(P. P. L.)	27·1	144	5·11	7·660	16·5	465	7·575	13	582	− 85	−3·5	+117
4	(J. B.)	18	115	5·5	9·234	21	441	8·467	17	474	− 767	−4	+33
5	(Ma.)	21	155	5·11	9·150	17·7	517	8·220	14·4	573	− 930	−3·3	+56
6	(B.)	14·8	91	4·8	6·030	14	431	6·756	12·4	550	+ 726	−1·6	+119
7	(G.)	22·9	173	6·2½	9·753	10	981	9·434	8·7	1089	− 319	−1·3	+108
8	(H.)	20·4	140	6·0	5·113	17	300	6·360	16	397	+1247	−1	+97
9	(G. A.)	20	133	5·7	5·008	14·7	341	6·053	14	432	+1045	−·7	+91
10	(A.)	19·5	129	5·6	6·350	10	638	6·420	9·7	677	+ 70	−·3	+39
11	(Ben)	21	131	5·6	5·168	19	271	5·597	18·7	303	+ 429	−·3	+32
12	(B. R. P.)	22·1	123	5·5	7·570	19·4	392	7·840	19·4	403	+ 270	—	+11
13	(F. C.)	20	140	5·10	9·504	24	396	8·712	24	363	− 792	—	−33
14	(A. H. G.)	21·6	126	5·7	5·560	13·5	416	6·430	15	430	+ 870	+1·5	+14
15	(R. D. P.)	19·5	134	5·5	7·900	17	463	7·700	20	380	− 200	+3	−83
16	(L.)	21·9	126	5·6	5·458	12·4	450	6·667	15·4	434	+1209	+3	−16
	Average ...	20·7	134	5·7	7·105	16·7	425	7·325	15·5	505	+ 208	−1·3	+80

The comparative effect upon striped muscle of alcohol, ether and chloroform. By A. D. WALLER.

Several years ago, in the course of a prolonged investigation of the action of various reagents upon isolated nerve, I studied (and demonstrated to the Society[1]) the comparative effects upon nerve of ether and chloroform. I then estimated that chloroform vapour as regards its action upon nerve is physiologically 8 to 10 times as powerful as ether vapour, but made no attempt to establish any quantitative comparisons as regards alcohol vapour.

The present communication gives the results of a careful comparison of the physiological effectiveness of alcohol, chloroform and ether in solution upon isolated muscle. The solutions were made up in tap-water saline, 0·6 %, on a molecular scale, viz.

Ethyl Alcohol	5·8 c.c. per	100 = 1	M solution.
Ether	1·0 c.c. per	100 = 0·1	M solution.
Chloroform	0·8 c.c. per	1000 = 0·01	M solution.

These strengths, viz. molecular of alcohol, decimolecular of ether and centimolecular of chloroform, happen in point of fact to be very nearly "physiologically equivalent."

Comparisons were systematically made (1) between alcohol and chloroform, (2) between alcohol and ether, and (3) between ether and chloroform by means of the double railway myograph, and two sartorius muscles set up as demonstrated at the last meeting of the Society.

The method is very convenient and exact, affording as it does a series of systematic records of (1) the simultaneous effects of a pair of solutions upon a pair of muscles; and (2) the successive effects of the same pair of solutions upon the same pair of muscles in reversed order of application.

Its results will be best illustrated by two examples given *in extenso*, the first (Aug. 25) of an experiment in which it was considered that a physiological equality of action had not been obtained, the second (Aug. 26) in which such equality had been as nearly as possible secured at the strengths taken.

[1] "Action of Anæsthetics upon isolated nerve," *Proc. Physiol. Soc.*, November, 1895. Also in *Lectures on Animal Electricity*, 1897, Longmans, Green & Co.

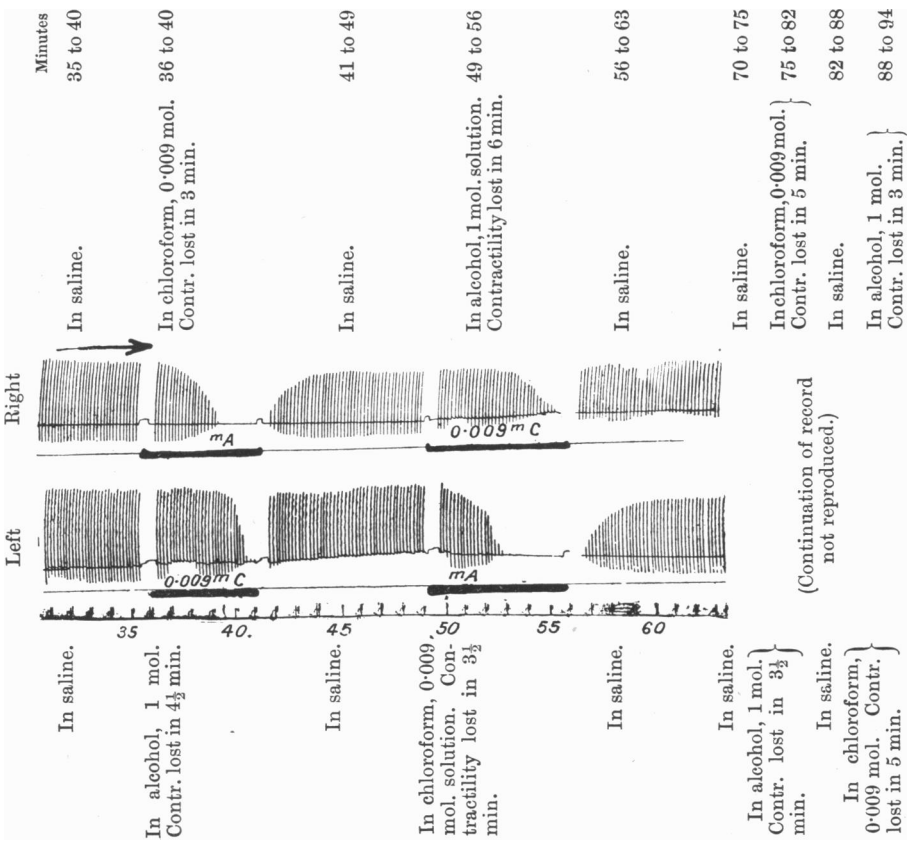


Fig. 1. Aug. 25, 1908. Simultaneous record of Right and Left Sartorius muscles. Effects of Ethyl Alcohol, 1 mol. solution, and of Chloroform, 0·009 mol. solution. Temp. = 20°.

It will have been seen from these two examples that the principal indication made use of is the rate at which the contraction of the immersed muscle has been diminished and abolished. Another indication of value is afforded in certain instances by the rate of recovery when the intoxicant solution is replaced by normal saline.

Examples of these two points are afforded by the following numbers:

Date	Solution	Time of abolition of contraction	Time of reappearance of contraction
Aug. 21	Ether 0·10 M.	15 minutes	immediate
	,, 0·15	5 ,,	immediate
	,, 0·20	2 ,,	2 mins.
Aug. 20	Chloroform 0·1 % by vol.	6 ,,	2 mins.
	0·05 ,,	11 ,,	immediate
Oct. 1	Alcohol 1 M.	5 and 5 mins.	1 and 1 min.
	2 M.	2 and 2 ,,	11 and 11 mins.

Time of immersion *per se* apart from strength, influences the time of reappearance of contraction, *e.g.* in an experiment *ad hoc*, where the first sign of reappearing contraction was taken by stop-watch after immersion in a 1 m. (= 5·8 c.c. per 100) solution of alcohol for 5, 10 and 20 minutes the times of reappearance were 30, 50 and 75 seconds respectively.

Considerable alterations of *temperature* markedly influence the rate of intoxication (and of recovery) by alcohol, ether and chloroform. The velocity of reaction between drug and muscle, as shown by the rate at which contraction is abolished, is between 2 and 3 times as great at 30° as at 20°, *e.g.*

Date	Solution	Temperature	Time of abolition of contraction
Aug. 18	Alcohol 5 %	19°	7 mins.
	Do.	30°	2½ mins.
Aug. 25	Chloroform 0·02 M.	19°	2 and 2½ mins.
	(0·16 c.c. per 100)	28°	¾ and 1½ ,,
Aug. 27	Ether 0·15 M.	20°	4 and 4½ ,,
	(1·5 c.c. per 100)	28°	1½ and 1½ ,,

The general conclusion of the present series of experiments on the relative anæsthetic power of alcohol, ether and chloroform is given in the following table:—

	Physiological equivalence			Physiological effectiveness		
	By molecules	By weight	By volume	By molecules	By weight	By volume
Alcohol	1·00	1·000	1·000	1·0	1·0	1·0
Ether	0·12	0·193	0·213	8·3	5·2	4·7
Chloroform	0·01	0·026	0·014	100·0	39·0	73·0

Note.—I find that approximately equal effects are obtained with alcohol 2 M., ether 0·2 M., and chloroform 0·02 M. I also find that the effect of a mixture composed of equal volumes of chloroform solution at 0·16 c.c. per 100 and of ether at 2·5 c.c. per 100 is practically identical with that of the chloroform alone and of ether alone. This signifies that the anæsthetic actions of the two reagents are simply additive.

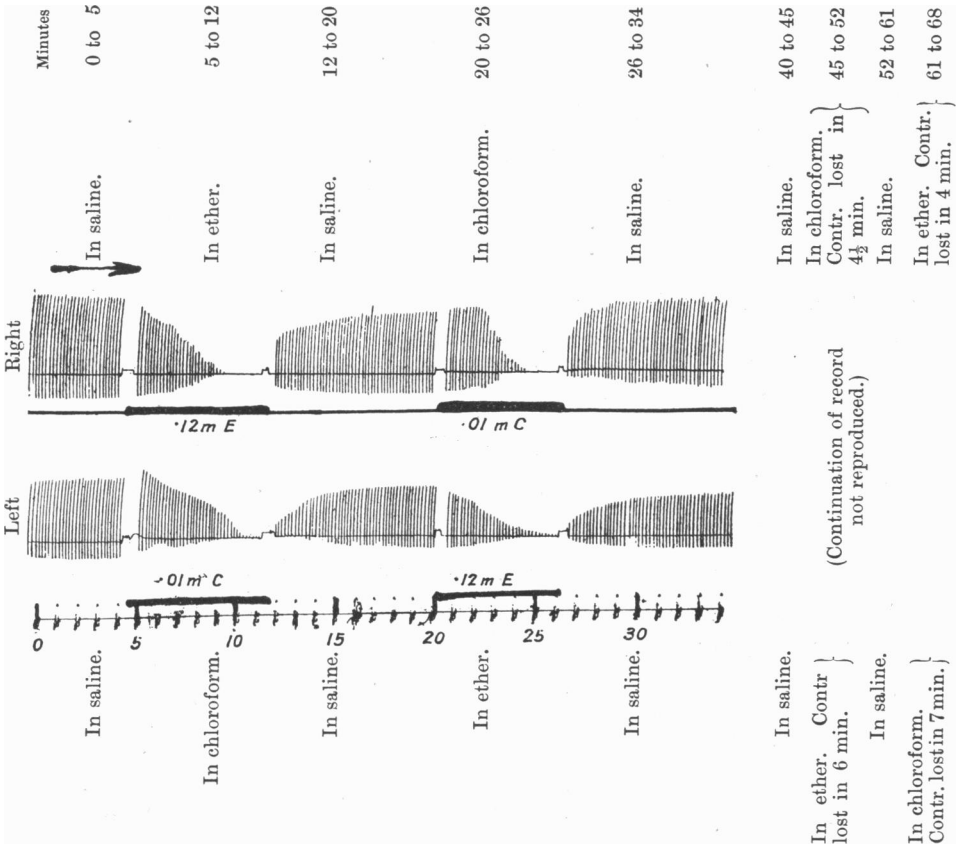


Fig. 2. Aug. 26, 1908. Simultaneous record of the effects of CHLOROFORM, 0·01 mol. and of ETHER, 0·12 mol. on two sartorius muscles.

Observations on the Deep and Surface Temperature of Man. By A. S. MORTON PALMER, M.A., M.B., B.C.

There is a need at the present time for further observations on human temperature, a subject usually neglected and left to the care of the nursing staff. Moreover, many observations that have been made are unreliable, especially those that have been taken in the mouth. These are especially fallacious in cases of heart failure, as shown by the following observations on six cases whose ward charts showed a mouth temperature regularly subnormal.

	Air	Rectum	Mouth	Skin	Pulse	Resp.	
1. Failing heart	61·7°	99·6°	97·0°	95·0°	108	32	
2. Failing heart, mitral disease	59·0	98·3	97·6	92·3	44 to 52	20	5 p.m. 8/4/08.
" " "	58·1	97·8	95·9	92·8	44	20	11 a.m. 9/4/08.
3. Aortic regurgitation	65·3	98·2	95·6	93·2	96	44	6.15 p.m. 4/5/08.
4. " "	—	98·3	below 95·0	94·6	136	36	
5. Mitral regurgitation	65·8	99·4	below 95·0	93·9	68	28	8.30 p.m. 17/8/08.
6. Aortic aneurysm	54·5	99·0	98·0	91·0	76	16	6 p.m. 27/4/08.

All were grave cases presenting various degrees of orthopnœa and dyspnœa, the pulse of Nos. 2 and 4 being particularly bad. The internal temperature of these cases, though sometimes slightly under the normal as in case 2, appears never to sink to the level accredited to them on the strength of the oral readings, which in cases 4 and 5 were at much the same level as those of the skin.

The following observations were made on three new-born infants. Their rectal and surface temperatures were taken immediately after birth, simultaneously with those of the mother, and contrasted with later temperatures before and after a warm bath.

	Rectum of infant	Rectum of mother	Surface of infant	Surface of mother	Air
1. 8 months child. At birth. 9.45 p.m. ...	101·4°	100·8°	96·8°	—	68·0°
10.45 p.m.	98·0	—	92·3	—	68·9
11 p.m. after 2½ mins. bath at 105·8° ...	96·0	—	95·3	—	—
Next morning, 11 a.m.	99·4	—	95·0	—	64·4
2. (Taken by nurse). At birth. 10 a.m. ...	99·4	98·8	89·6	86·0	64·4
10.15 a.m.	99·0	98·4	—	—	—
After birth at 100° F.	98·0	—	—	—	—
3. Mother 16 years old. Infant at birth. 2 a.m. 21/5/08	99·6	98·4	96·8	95·9	72·5

In all these the temperature of the child when delivered was higher than that of the mother. The effect of the hot bath in cases 1 and 2 was to raise the surface and lower the internal temperature.

The next table relates to observations on typical cases of lobar pneumonia.

		Rectum	Surface	Mouth	Air	Pulse	Resp.	
1.	4 yrs. old. 4.45 p.m. May 30, at height of fever ...	103·6°	98·9°	—	60·4°	112	48	
	At crisis, 2.50 a.m. May 31st, dry skin	98·2	92·3	—	63·1	96	34	
	6 a.m. (taken by nurse) ...	98·0	94·1	—	—	100	36	
2.	13 yrs. 4 p.m. 4/4/08, 3rd day	105	98·6	105	59·9	112	34	
	8.30 p.m. 5/4/08	105	100·4	104·4	58·1	104	40	
	False crisis 6 a.m. 7/4/08, (skin dry)	100·2	94·6	99·4	59·9	72	32	
	12.45 p.m.	102·4	98·0	102·4	58·1	96	32	
	7 a.m. 16/4/08, when well ...	98	92·3	97·4	59·0	64	20	
3.	Age 17. 6.15 p.m. 7/4/08, 3rd day	105·2	100·0	—	61·1	112	44	Axilla[1] 103·6
	4.35 p.m. 8/4/08	104·6	100·0	—	61·7	108	36	103·6
	9/4/08	101·8	97·1	—	61·7	84	32	100·4
	11 a.m. 11/4/08. 24 hrs. after crisis	99·4	94·1	—	59·9	72	32	98·5
4.	4.15 p.m. 6/4/08	103·2	98·6	103·0	59·9	112	34	

In the first case the excess of the rectal temperature at the height of the fever over the rectal temperature after the crisis was 4·6°, while the similar excess of skin temperature was 4·8°. Therefore the skin rose + 0·2° relatively more than the rectum. In the second case the excess of rectal temperature at the height of the fever over the same after the crisis was 7·0°, while the excess of surface temperature was 8·1°, the skin thus rising 1·1° relatively more than the rectum. The skin in all these cases felt hot and dry and in No. 1 did not show sweating at the crisis.

In atypical pneumonias different results were obtained. Thus a grave case of lobar pneumonia in a man of 72 suffering from glycosuria presented the following chart:

	Rectum	Surface	Air	Pulse	Resp.
10 a.m. 13/8/08. 1st day of illness	99°	—	—	116	26
10 p.m. ,, ,, ,,	102	96·4	68·0	132	30
10 p.m. 15th	99	96·4	67·1	132	28
1 a.m. 17th	100·4	96·3	67·1	128	20
2 p.m. 25th. Well	98·2	94·1	69·8	98	25

He recovered unexpectedly.

[1] The axillary was taken instead of the mouth owing to nasal obstruction.

An alcoholic case, who died the following day, gave these readings:

Rectum	Mouth	Surface			Air	Pulse	Resp
		1 Left side of abdomen	2 Right side of thorax	3 Left side of thorax			
104·2°	103·4°	97·1°	98·24°	98·24°	63·5°	104 irregular	34

Thus the rectal temperature rose some 5° above normal, the skin only 2·1°.

In typhoid fever different conditions prevail. Thus

		Rectum	Mouth	Surface	Air	Pulse	Resp.
1.	11.30 a.m. 12/4/08	101·6°	101·4°	96·4°	58·6°	96	20
	6.20 p.m. 13/4/08	102·8	102·6	96·8	54·7	88	24

Another, a severe case with meningeal symptoms, gave on 31/7/08 at 9 p.m. rectal temperature 106·0°, surface 98·6°. In the first case the rectal temperature was some 3·0° above the normal, the skin 2·7°; in the second the rectal excess was about 6·4°, the skin only 4·1°.

I have taken temperatures of three cases of measles, which all show relatively lower skin temperatures.

		Rectum	Surface	Air	Pulse	Resp.
1.	4 yrs. 1st day of rash, 9 p.m. 12/5/08	103·6°	98·9°	66·2°	144	32
	1.25 p.m. 13/5/08	103·6	96·4	62·6	148	36
	9 p.m. 14/5/08	99·8	91·0	—	116	36
2.	2 yrs. 1st day of rash, 9.20 p.m. 12/5/08	104·8	97·1	64·4	168	36
	9 p.m. 14/5/08	96·4	91·4	62·2	80	28
3.	3½ yrs. 1st day of rash, 9.30 p.m. 5/8/08	103·8	96·8	65·3	120	24

The first taken skin temperature in No. 1 may owe its rather high level to the fact that a warm bath had just been given.

The most striking instance of lowered skin temperature is seen in a case of suppurating abdominal growth during a rigor.

	Rectum	Mouth	Surface
10.15 p.m. 25/3/08	103·2°	102·8°	97·7°
2.30 p.m. 26th	103	102·5	100·4
6.40 p.m. 27th, during rigor ...	104·2	101·4	86·7
7.15 p.m., 20 mins. after rigor ...	105·4	101·8	87·4
8.30 p.m. 28th	101·4	100·6	98·0

Of pernicious anæmia I have a chart recording a rectal temperature 105·6° and surface temperature 99·5°, in secondary syphilis a rectal temperature 101·6°, surface 95·0°.

The effect of chloroform and ether I have studied in four cases where anæsthesia lasted one hour or longer. In all cases the rectal temperature fell from 0·7° to 2·2°, while the surface rose from 0·8° to 3·6°, in fact proportionately more. The intra-spinal injection of novocaine in a case of "perforated typhoid" produced absolutely no change in surface or internal temperature during the period of 40 minutes.

The surface temperature in these cases has been taken by the flat-bulbed thermometers, placed two inches to one side of the middle line of the abdomen. The thermometers were supplied by Dr Pembrey from a grant from the British Medical Association.